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Revision of the African species of the termitophilous tribe Corotocini (Coleoptera, Staphylinidae) II. The genera *Termitomimus* Tragardh and *Nasutimimus* new genus and their relationships[1]

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Introduction and Taxonomic History

The genus *Termitomimus* was first described and placed in the subfamily Aleocharinae in a very interesting paper by Trägårdh (1907) based upon material he collected in Zululand. In the same paper he reported the histological work he did on the species during which he found 2 types of glands: The cephalic glands at the posterior of the head which open by fine pores in the cuticle; and, the prothoracic glands which open at the cuticular fold between the head capsule and the anterior edge of the pronotum. Thus from the start, *Termitomimus* was known to contain glands in these 2 regions.

Interestingly enough, Trägårdh did not find glands in the abdomen of these insects and attributed the physogastry of the abdomen to the hypertrophy of the fat body. He noticed the resemblance of the recurved abdomen to the general shape of termite nymphs and interpreted the curved abdomen as being a tactile facsimile of a termite. I have recently commented on the mimicry theory with reference to another genus and species of termitophile (Kistner 1968), where the resemblance is more striking but this resemblance also holds true for at least some species of *Termitomimus* and *Nasutimimus* (see Figs. 2C, 4A, 5A, and 6A) and I believe it is apparent to some extent in all species although the photographs are designed to show taxonomic features and not to show the resemblance to termites. Trägårdh also stated that the neck-shaped portion of the abdomen (called the pseudothorax) might facilitate the movement of the pseudohead which contains the male genital organs to facilitate coition, which, because of the morphological modification, would by necessity have to occur face to face. The terms pseudocaput, pseudothorax, and pseudoabdomen were invented by Trägårdh to denote the 3 principle areas of the abdomen, separated by constrictions, in its recurved position over the dorsum of the beetle. These terms are retained here as useful descriptive devices, even though Trägårdh's ideas on mimicry have not, as yet, been tested vigorously. The histology of the insect, especially that of the abdomen, should also be restudied eventually using modern fixation and staining techniques.

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[1]This study was financed in part by the National Science Foundation (Grant No. NSF-GB-6284).

Warren (1920) found additional specimens of the genus near Pietermaritzburg and also found what he considered to be the larva, although to my knowledge he never described it.

No more related specimens were captured until Professor A. E. Emerson collected 65 specimens from *Nasutitermes* nests in the Congo in 1948. These were described as new species by Seevers (1957).

Since 1963, Dr. W. G. H. Coaton and his colleagues have been watching very carefully for termitophiles in their termite surveys of the Republic of South Africa and its dependency, South-West Africa. As I studied the 265 specimens sent me, it became apparent that the entire genus should be revised and the 2 species from *Nasutitermes* nests should be placed in a new genus. This then is the purpose of this paper.

Methods

Although I have opened literally hundreds of *Trivervitermes* and *Nasutitermes* nests and collected many termitophiles, such of which are far rarer than *Termitomimus* sp., it has not been my lot to collect any of these species. I just have not been at the right place at the right time. Mr. J. L. Sheasby, who has collected many of them, told me that the technique I was using was the correct one. This consists of breaking up the nests, knocking out the contents of the pieces into a tray, and then watching for them.

Most of the laboratory methods used have been described in earlier papers (Koblick and Kistner, 1965 and Kistner, 1966). Because of the fragility of the specimens, certain deviations were made. The specimens cannot be allowed to dry out as the shape of the specimens changes radically when even a small amount of drying occurs. Thus all specimens were photographed in alcohol. To do this a small amount of petroleum jelly is placed on the bottom of a syracuse dish. The next hour or 2 is then spent getting as many of the little bubbles out of the petroleum jelly as possible by pushing them out with a needle under alcohol. The specimen is then anchored in the petroleum jelly and positioned under a binocular microscope. It can then be photographed in the usual manner.

All specimens should be preserved in alcohol and kept in fluid when stored. Fixation in the field should be in alcoholic Bouin's fluid. Dried specimens can be somewhat rehydrated by allowing them to soak in water for a day or so prior to study. Due to conditions beyond my control, all of the specimens of *Termitomimus seeversi* n.sp. and *T. vanderlindei* n.sp. were dried when I received them so the photographs are of rehydrated specimens. This is the reason for the bubble within the abdomen of *T. seeversi* (Fig. 5C).

The specimens had to be measured somewhat differently than normal staphylinids because of the recurved abdomens. The following are the definitions of the measurements reported in this paper. Head length is the length of the head measured from the most anterior part of the dorsal border to the most posterior part of the dorsal border. Because the head shape is constant this results in a midline measurement taken from the lateral view. Similarly, the pronotum length is a midline measurement taken from the lateral view. Maximum length of the pseudocaput is the distance between sternite VI and the end of the abdomen

taken from the lateral view. Maximum length of the pseudothorax is the distance between sternite V and sternite VI taken from the lateral view. The length of sternite III is the distance from the beginning of the abdomen to the end of the sclerite III in *Termitomimus*; the functionally equivalent measurement in *Nasutimimus* is the distance from the beginning of the abdomen to the functionally posterior end of the abdomen, i.e., the point of curvature. The maximum widths of the pseudocaputs and pseudothoraxes are the only measurements taken from the top of the specimen and are self-explanatory.

Locations where samples were taken are indicated as follows: 13 mi. ex Pretoria-Pienaars River. This means 13 miles from Pretoria on the road to Pienaars River.

The computer programs used for numerical analysis were originally written in FORTRAN II and were run in that form for this study. Since then the programs have been rewritten in FORTRAN IV and now, with the help of Mr. L. Neil Bell, Applications Analyst for Control Data Corporation, are written in extended FORTRAN. Many people have contributed to the evolution of these programs, including Mr. Herbert Jacobson, now in the Department of Biology, University of Victoria, Mr. Robert Banfill, now with IBM, Mr. L. Neil Bell, and myself. All this has taken place in a little over 3 years. So no program is published with this paper, as I am sure that the programs will be still further altered as I add new features or programs based on the writings of Wilson (1965) and Talkington (1967). Anyone wishing copies of these programs will be sent current print-outs upon request.

Genus *Termitomimus* Trägårdh

Termitomimus Trägårdh, 1907: 173; Fenyes, 1918: 60; Warren, 1919: 101; Kemner, 1925a: 17; Kemner, 1925b: 108; Seevers, 1957: 153.

Type of the genus: Termitomimus entendveniensis Trägårdh (Blackwelder, 1952: 378).

Distinguished from all other genera by its distinctive abdomen. Closely related to *Termitopullus* Reichensperger through the pronotum shape, head shape, and the shape of the mouthparts but easily distinguished from it through the extensive membranous development of the abdomen. Closely related to *Nasutimimus* new genus by the membranous development of the abdomen but distinguished from it by the extensive sclerotization of the ventral part of the abdomen in the vicinity of sternite III (compare Figs. 2 and 7).

Overall body shape as in Figs. 2-5. Head narrower in front than behind, slightly longer than broad, with a median posterior hyaline triangle. Eyes present, well-developed, both forward and laterally directed. Antennae inserted between the eyes. Gula very narrow anteriorly, becoming very wide at the base. Mentum-submentum small, rectangular in shape. Clypeus very short. All mouthparts except for the maxillae are extremely small; the maxillae are somewhat reduced. Labrum extremely small, reduced to a very thin dorsal flap. Mandibles reduced and shaped as in Fig. 1A, with no median teeth. Maxillae shaped as in Fig. 1B, palpi 4-segmented but with the fourth segment reduced to where it almost looks like a seta. Labium extremely small, palpi appear to be 1-segmented as reported by

Trägårdh, even under 440x magnification. Antennae 11-segmented, shaped as in Fig. 1C, with 2 coeloconic sensillae on the apical segment.

Pronotum subquadrate, slightly wider than the head, slightly longer (16%) than wide, with a median hyaline triangle at the anterior edge, somewhat physogastric. The base of the triangle is at the anterior border and the apex in the midline of the pronotum slightly anterior of the center. Prosternum small, with an evenly rounded ventral median bulge. Mesothoracic peritremes modified into strap-like sclerites closing the procoxal cavities behind and helping to support the membranous areas of the posterior thorax. There is some enlargement of the

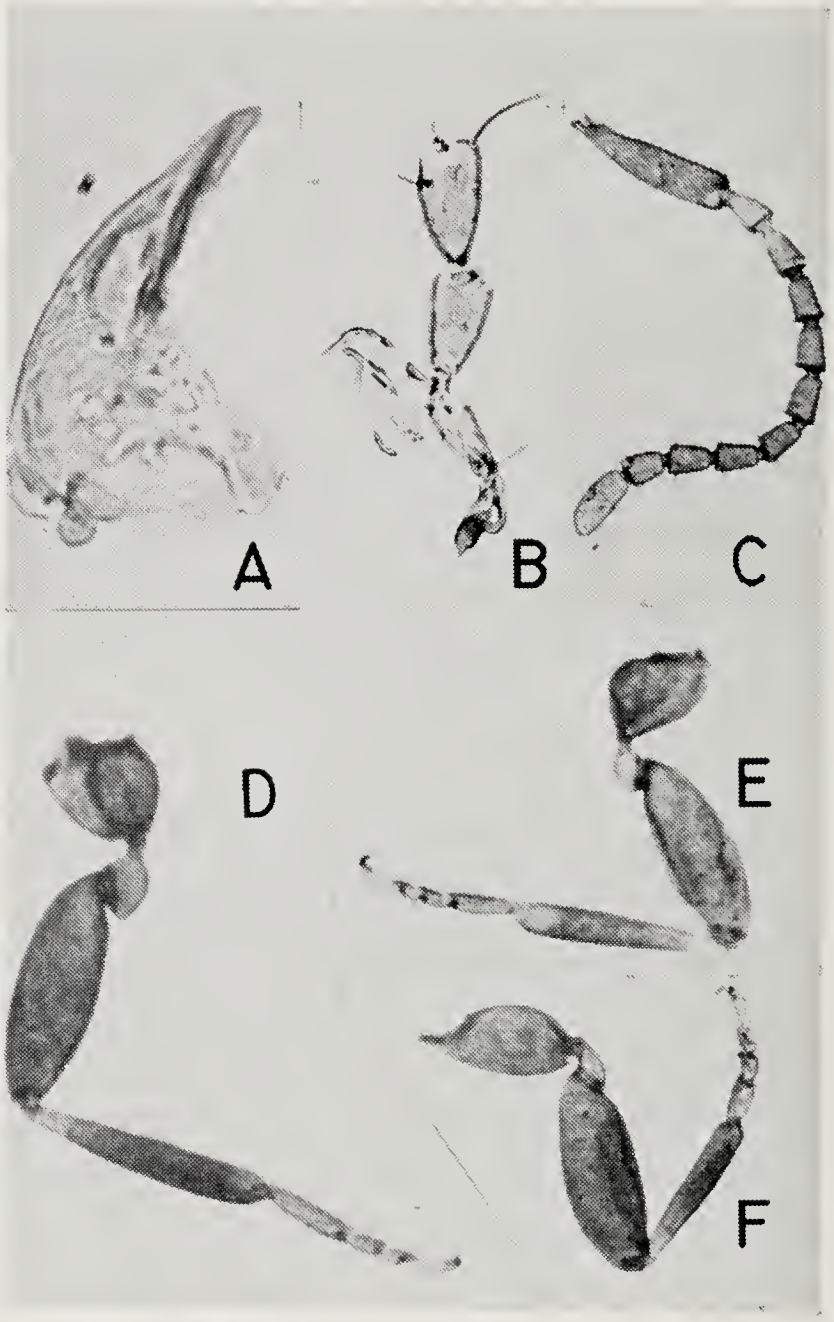

Fig. 1. *Termitomimus entendveniensis* Trägardh: A. Right mandible; B. Maxillae; C. Antenna; D. Metaleg; E. Mesoleg; F. Proleg. Scale arbitrary, photos A and B were taken at 250x magnification while the rest were taken at 100x.

membranes attaching the thorax to the head and the membranes attaching the pronotum to the rest of the thorax. Meso- and metasterna without a sharp line of demarcation, appearing completely fused. Mesosternal intercoxal area wide and without a carina. Both meso- and metacoxae are set widely apart. Elytra normal, without distinction. Wings reduced to small membranous flaps, useless for flight. Legs shaped as in Figs. 1D, 1E and 1F. Note the enlarged and lengthened shape of the coxae of the hind leg, such that the coxa is very similar to that of the mesoleg in shape, and a major departure from the usual flat subtriangular shape found in other Aleocharinae. Tarsal formula 4-4-4.

Abdomen inflated with large amounts of hypertrophied membrane exposed and the entire abdomen recurved permanently over the dorsal surface of the body (see Figs. 2-5). Since the sternites of most of the abdomen are now dorsal and the posterior end of the abdomen is now anterior (sometimes even anterior to the head), all further terminology will apply to the morphological orientation rather than a functional one, unless otherwise specified. Abdominal segment I membranous. Tergite II either entirely missing or fused to the anterior rim of tergite III. Tergites III-VII closely adherent with the dorsal anterior processes elongated so as to overlap and strengthen the recurved abdomen. Tergites III-VI otherwise very similar to those of a free-living aleocharine Staphylinid and bearing spiracles. Tergite VII bearing posteriorly directed processes which serve as support for the widened collar or pseudocaput in this area. These processes appear to be derived from the paratergites of segment VII. Paratergites of segment III-VI appear to be fused with the tergites and to be posteriorly developed to overlap the forward directed processes of these tergites to produce the strengthening device for the recurved abdomen. Tergite VIII with shorter forward directed processes but otherwise appears normal and without paratergites. Segment IX trivalved with long asymmetrical anterior directed processes in the male; with shorter symmetrical anterior directed processes in the female. Nearly all Aleocharinae exhibit this characteristic but it is particularly noticeable in species like these where a relatively large male genitalia has to be protruded and retracted through a relatively small abdominal segment IX. The count of the tergites is obviously an interpretation but these have to be labelled somehow, so the count was derived by starting with a relatively normal segment IX and tergite VIII and then counting backwards to the more modified segments. Because it is simpler to assume that tergite II is the missing segment than that a segment was lost in the middle of the abdomen, this interpretation was used here. The sternites are even more difficult to interpret. Fortunately enough specimens were available for study so that some could be cleared. The large sclerotized part at the curvature of the abdomen and anterior to it is here interpreted as sternite III. Sternite II is typically absent in Aleocharinae and sternite I is always absent. Sternite IV is a weakly sclerotized sternite posterior to the curve and on the functionally dorsal surface. Sternites IV-VII are represented by regularly placed sclerotized patches which are easily interpreted but whose size and shape vary by species. Sternite VIII and IX are regularly shaped. The precise shape of the membranous portions of the abdomen vary by species but in general there is an enlarged functionally posterior portion, a somewhat constricted but still enlarged portion functionally anterior to that and an extremely enlarged portion functionally anterior to that. These were given the names pseudocaput, pseudothorax, and pseudoabdomen by Trägårdh and I shall adhere to those terms here. Male genitalia is large and bulbous and has simple lateral lobes. The shape is constant throughout the genus but the size varies by species. Since there are better size indices of the species, the male genitalia will not be used to define the species. No sclerotized spermatheca present in females.

Notes: This description is different from that of Seevers (l.c.) primarily be-

cause the specimens available for study by Seevers are all herein placed in the new genus *Nasutimimus*. He did however note the difference between the mouthparts he saw and those described by Trägårdh.

Key to Species of *Termitomimus*

1. Sternites (dorsally) of the abdomen extensively sclerotized, all reddish brown in color; pseudo-thorax developed laterally into dorsally directed appendage-like lobes (Figs. 5A and 5C)..... 2
1′. Sternites (dorsally) of the abdomen not extensively sclerotized, yellowish brown in color; pseudo-thorax developed laterally into flat flap-like lobes which are directed mostly to the side (Figs. 2A and 3A)..... 3
2. Outline of pseudoabdomen at the curvature evenly rounded when viewed from the top; sternite VI entire, without an upside-down V-shaped triangle in the middle..... *T. seeversi* n.sp.
2′. Outline of the pseudoabdomen at the curvature semihexagonal when viewed from the top; sternite VI with an upside-down V-shaped triangle of weak sclerotization in the middle..... *T. pretoriusi* n.sp.
3. Lateral edges of the pseudocaput developed into long appendage-like lobes which extend past the pseudothorax (Fig. 4B)..... *T. coatoni* n.sp.
3′. Lateral edges of pseudocaput not so developed..... 4
4. Abdomen with longer and more numerous setae at the curvature of the abdomen (morphologically at the posterior edge of the third sternite).... 5
4′. Abdomen with very few setae which do not become more numerous nor longer at the curvature of the abdomen..... 6
5. Membrane of the abdomen between abdominal sternites III and IV with many setae, situated on wart-like tuberosities..... *T. hettyae* n.sp.
5′. Membrane of the abdomen between abdominal sternites III and IV without setae, devoid of tuberosities..... *T. sheasbyi* n.sp.
6. Extension of abdominal sternite III plainly visible from the dorsal view about midway between sternite III and IV (Figs. 2A and 2C)..... 7
6′. Extensions of abdominal sternite III not plainly visible, what traces can be seen are closer to sternite IV than to the posterior edge of sternite III..... *T. entendveniensis* Träg.
7. Pseudocaput much larger than pseudothorax (Fig. 2A); 6 setae on sternite VIII..... *T. alzadae* n.sp.
7′. Pseudocaput only slightly larger than the pseudothorax; 8 setae on sternite VIII..... *T. vanderlindei* n.sp.

***Termitomimus alzadae* n.sp.**

Figs. 2A, 2B, and 9

Most closely related to *T. vanderlindei* n.sp. from which it is distinguished having but 6 setae on abdominal sternite VIII. Also the maximum width of the

pseudocaput is proportionately wider than that of *T. vanderlindei*, and the third sternite somewhat longer.

Fig. 2. *Termitomimus alzadae* n.sp.: A. Dorsal view; B. Lateral view. *T. vanderlindei* n. sp.: C. Dorsal view; D. Lateral view. Scale arbitrary, see descriptions for measurements. Dorsal and lateral views are of the same specimen taken at the same magnification and given identical enlargement.

Overall body shape (dorsal and lateral) as in Figs. 2A and 2B. Basic color of the sclerotized portions of the head, pronotum, elytra, and antennae light yellowish brown, with the dorsal portions of the pronotum a little darker but still yellowish brown. Legs blackish brown except for the tarsi which are light yellowish brown. Sternites very light yellowish brown except for sternite III which is orange-brown. Tergites somewhat darker. Basal tarsal segment of the hind leg slightly broader and very slightly shorter than the rest of the tarsus, so slightly (0.02 mm) so as to be considered approximately equal.

Membranous parts of the abdomen with a sparse covering of fine setae which are more numerous and somewhat longer at the curvature (morphologically posterior to sternite III). Abdominal sternite III with no basal median split. Secondary sclerotization is involved in the formation of sternite III, V, VI, and VII. Pseudocaput wider than the pseudothorax. Sternite VIII with 6 setae. Outline of recurved abdomen at the functionally posterior border broadly rounded and blunt.

Measurements: Head length, 0.24-0.26 mm; pronotum length, 0.25-0.26 mm; maximum length of pseudocaput, 0.62-0.67 mm; maximum length of pseudothorax, 0.22-0.25 mm; length of sternite III, 0.75-0.80 mm; maximum width of pseudothorax, 0.63-0.69 mm; maximum width of pseudocaput, 0.98-1.02 mm. Number measured, 10.

Holotype: 1, No. 12563, South-West Africa, Ovamboland, 30 mi. ex Rua Cana Falls—Eunda, (17° 15-29′ S, 14° 30-44′ E), 12 September 1966, Coll. J. L. Sheasby, ex nest below low moundlet, No. T-493. In the National Collection of Insects, Pretoria.

Paratypes: South-West Africa: 3, same data as holotype, (NCI, DK); 2, 40 mi. ex Outjo—Otjikondo, 7 April 1966, ex nest below moundlet, Coll. J. L. Sheasby, No. T-447, (NCI, DK); 1, 10 mi. ex Otavi—Tsumeb (19° 30-44′ S. 17° 15-29′ E), 5 September 1966, ex nest below low moundlet, Coll. J. L. Sheasby, No. T-487, (NCI); 8, Ovamboland, 30 mi. ex Ondangua—Ombalantu (17° 30-44′ S, 15° 30-44′ E), 9 September 1966, ex nest below low moundlet, Coll. J. L. Sheasby, No. T-491, (NCI, DK); 4, Ovamboland, 50 mi. ex Ombalantu—Oshikango (17° 15-29′ S, 15° 30-44′ E), 13 September 1966, ex nest beneath low moundlet, Coll. J. L. Sheasby, No. T-494, (NCI, DK); 3, Ovamboland, 20 mi. ex Elundu—Ondema (17° 15-29′ S, 16° 45-59′ E), 16 September 1966, ex nest beneath prone log, Coll. G. F. Pretorius, No. T-498, (NCI, DK); 1, Ovamboland, 20 mi. ex Oshikango—Ombalantu (17° 15-29′ S, 15° 30-44′ E), 22 September 1966, ex nest below moundlet, Coll. W. G. H. Coaton, No. T-501, (NCI); 2, Okavango, 40 mi. ex Kuring Kuru—Runta (17° 45-59′ S, 19° 00-14′ E), 1 October 1966, ex nest below low moundlet, Coll. J. L. Sheasby, No. T-511, (NCI, DK); 1, Eiseb Omuramba, 100 mi. ex Otjinenu—Pt. 71 (20° 30-44′ S, 20° 00-14′ E), 11 April 1967, Coll. W. G. H. Coaton, No. T-543, (NCI); 5, 10 mi. ex Tsotsana—Botswana border (18° 45-59′ S, 20° 45-59′ E), 21 April 1967, Coll. G. F. Pretorius, No. T-578, (NCI, DK); 8, 10 mi. ex Tamso—Botswana border (18° 30-44′ S, 20° 45-59′ E), 23 April 1967, Coll. J. L. Sheasby, No. T-580, (NCI, DK); 4, 50 mi. ex Runtu—Karakuwisa (18° 30-44′ S, 19° 30-44′ E), 2 May 1967, Coll. J. L. Sheasby, No. T-591, (NCI, DK); 18, 90 mi. ex Runtu—Karakuwisa (18° 45-59′ S, 19° 30-44′ E), 3 May 1967, Coll. G. F. Pretorius, No. T-596, (NCI, DK); 1, 20 mi. ex Kano Vlei—Maroelaboom (19° 15-29′ S, 19° 00-14′ E), 4 May 1967, Coll. W. G. H. Coaton, No. T-602, (NCI); 6, 10 mi. ex Farm Guchab 595—Hohensee 304 (19° 45-59′ S, 17° 45-59′ E), 7 May 1967, Coll. W. G. H. Coaton, No. T-609, (NCI, DK); 1, Waterberg Plateau on Farm Kurland 457 (20° 15-29′ S, 17° 15-29′ E), 8 May 1967, Coll. W. G. H. Coaton, No. T-611, (NCI); 6, 20 mi. ex Farm Okosongominga 149—Lapaloma 438 (20° 45-59′ S, 17° 15-29′ E), 10 May 1967, Coll. J. L. Sheasby, No. T-613, (NCI, DK).

Notes: The majority of the specimens (51/75) were taken from nests determined as *Trinervitermes rhodesiensis* (Sjoestedt). These specimens are in the National Isoptera Collection, Pretoria, under accession numbers TM20066, TM21757, TM 19900, TM19982, TM20105, TM20417, TM20780, TM21271, TM21862, TM22479, TM22285, TM22493, and TM22666. Two specimens (T-447) were taken from a nest determined as *Trinervitermes rapulum* (Sjoestedt), specimens of which are in the National Collection of Isoptera, Pretoria, under the accession number TM18725. Twenty-two specimens (T-498, T-596, and T-611) were taken from 3 nests determined as *Trinervitermes dispar* (Sjoestedt). Specimens from these nests are in the same collection under accession numbers TM20260, TM22401, and TM22621. All determinations were made by Mr. W. A. Sands. The distribution of this species is shown in fig. 9.

***Termitomimus vanderlindei* n.sp.**

Figs. 2C, 2D, and 11

Very closely related to *T. alzadae* n.sp. and difficult to distinguish from it. It can be distinguished from *T. alzadae* by the presence of 8 setae on abdominal sternite VIII, the relatively narrower pseudocaput, and the somewhat shorter abdominal sternite III.

Overall body shape (dorsal and lateral) as in figs. 2C and 2D. Basic color of the sclerotized parts of the head, pronotum, elytra, and antennae light yellowish brown. Legs blackish brown except for the tarsi which are light yellowish brown. Sternites very light yellowish brown except for sternite III which is orange brown. Tergites somewhat darker. Basal tarsal segment of hind leg slightly broader and considerably shorter (0.07 mm) than the combined length of the rest of the tarsal segments of the metaleg.

Membranous parts of the abdomen with a sparse covering of fine setae which are more numerous and somewhat longer at the curvature. Abdominal sternite III with no basal median split. Secondary sclerotization is involved in the forma-

tion of sternites III, V, VI, and VII. Pseudocaput wider than the pseudothorax. Sternite VIII with 8 setae. Outline of recurved abdomen at the functional posterior border broadly rounded and blunt.

Measurements: Head length, 0.24-0.25 mm; pronotum length, 0.23-0.25 mm; maximum length of pseudocaput, 0.30-0.32 mm; maximum length of the pseudothorax, 0.12-0.15 mm; length of sternite III, 0.65-0.67 mm; maximum width of pseudothorax, 0.55-0.57 mm; maximum width of pseudocaput, 0.55-0.58 mm. Number measured, 4.

Holotype: 1, No. 13083, Republic of South Africa, Transvaal, Letaba District, 9 mi. ex Munnik—Mokeetsi, 12 February 1964, Coll. J. L. Sheasby, No. T-300. In the National Collection of Insects, Pretoria.
Paratypes: 3, same data as the holotype, (NCI, DK).
Notes: The host colony was determined as *Trinervitermes dispar* (Sjoestedt) by Dr. W. G. H. Coaton. Specimens of the host colony are in the National Isoptera Collection under accession number TM13351. This species is named for Dr. W. J. Van der Linde, Assistant Chief of the Plant Protection Research Institute, Pretoria. The distribution of this species is shown in fig. 11.

Termitomimus entendveniensis **Trägårdh**

Figs. 1, 3A, 3B, and 11

Termitomimus entendveniensis Trägårdh, 1907: 174, Figs. 1-10, pl. 1, Figs. 1-18 (Republic of South Africa, Natal, Entendweni Bush, near junction of the Black and White Umfolozi Rivers, with *Eutermes* sp.); Warren, 1920: 300 (Republic of South Africa, nr. Pietermaritzburg, *Trinervitermes trinerviformis* (Holmgren)); Seevers, 1957: 154 (no new host or locality data).

Most closely related to *T. hettyae* n.sp. from which it is distinguished by its overall shape (compare figs. 3A and 3B with 3C and 3D) and also by its slightly longer pronotum, its darker pronotum, by its lack of secondary sclerotization in the region of sternite V, by its obtuse abdomen at the curvature, as well as by the presence of 6 setae on sternite VIII, and the first tarsal segment of the hind leg being slightly shorter than the rest of the tarsal segments collectively. Also related to *T. coatoni* n.sp. from which it is distinguished by all the characters before the "as well as" above in addition to the lack of long posteriorly directed lateral processes from the pseudocaput and having the pseudocaput wider than the pseudothorax.

Overall body shape (dorsal and lateral) as in figs. 3A and 3B. Basic color of sclerotized portions of the head, pronotum, elytra, and antennae light yellowish brown with the dorsal portions of the pronotum darker. Legs blackish brown except for the tarsi which are light yellowish brown. Sternites very light yellowish brown except for sternite III which is orange-brown. Tergites somewhat darker. Basal tarsal segment of the hind leg slightly broader and slightly shorter than the rest of the tarsal segments collectively.

Membranous parts of the abdomen with a sparse covering of fine setae which neither increase in frequency or length at the curvature (morphologically posterior to sternite III). Abdominal sternite III with no basal median split. Secondary sclerotization involved in the formation of sternites III, VI, and VII. Pseudocaput wider than the pseudothorax. Sternite VIII with 8 setae. Outline of recurved abdomen at the functionally posterior border broadly rounded and blunt.

Measurements: Head length, 0.25-0.26 mm; pronotum length, 0.29-0.31 mm; maximum length of pseudocaput, 0.22-0.25 mm; maximum length of pseudothorax, 0.16-0.18 mm; length of sternite III, 1.00-1.02 mm; maximum width of pseudothorax, 0.94-0.96 mm; maximum width of pseudocaput, 0.98-1.02 mm. Number measured, 10.

Material examined: Republic of South Afriea: Transvaal: 29, 9 mi. ex De Langes Drift—Standerton, 10 and 11 September 1963, Coll. J. L. Sheasby, Nos. T-162 and T-163, (NCI, DK); 15, 16 mi. ex Standerton—Rooibank, 13 September 1963, Coll. J. L. Sheasby, No. T-170, (NCI, DK); 3, 13 mi. ex Pretoria—Pienaars River, 11 November 1963, Coll. J. L. Sheasby, No. T-183, (NCI, DK); 6, 28 mi. ex Pretoria—Pienaars River, 13 November 1963, Coll. J. L. Sheasby, No. T-186, (NCI, DK). Orange Free State: 4, 10 mi. ex Frankfort—Heilbron, 2 Oetober 1963, Coll. J. L. Sheasby, No. T-210, (NCI, DK); 54, 25 mi. ex Virginia—Theunissen, 3 Oetober 1963, Coll. J. L. Sheasby, No. T-211, (NCI, DK); 14, 20 mi. ex Bloemfontein—De Wetsdorp, 4 October 1963, Coll. J. L. Sheasby, No. T-212 and G. F. Pretorius, No. T-213, (NCI, DK).

Notes: The host colonies were all determined as *Trinerviternes trinervoides* (Sjoestedt) by Dr. W. G. H. Coaton and are loeated in the National Isoptera Colleetion, Pretoria, under accession numbers S-38, S-39, S-43, S-46, S-47, TM13111, TM13112, TM13114, and TM13116. *Trinerviternes trinerviformis* (Holmgren), the former reeorded host, was placed in synonymy with *T. trinervoides* (Sjoestedt) by Sands (1965, p. 132.) The distribution of this speeies is shown in fig. 11.

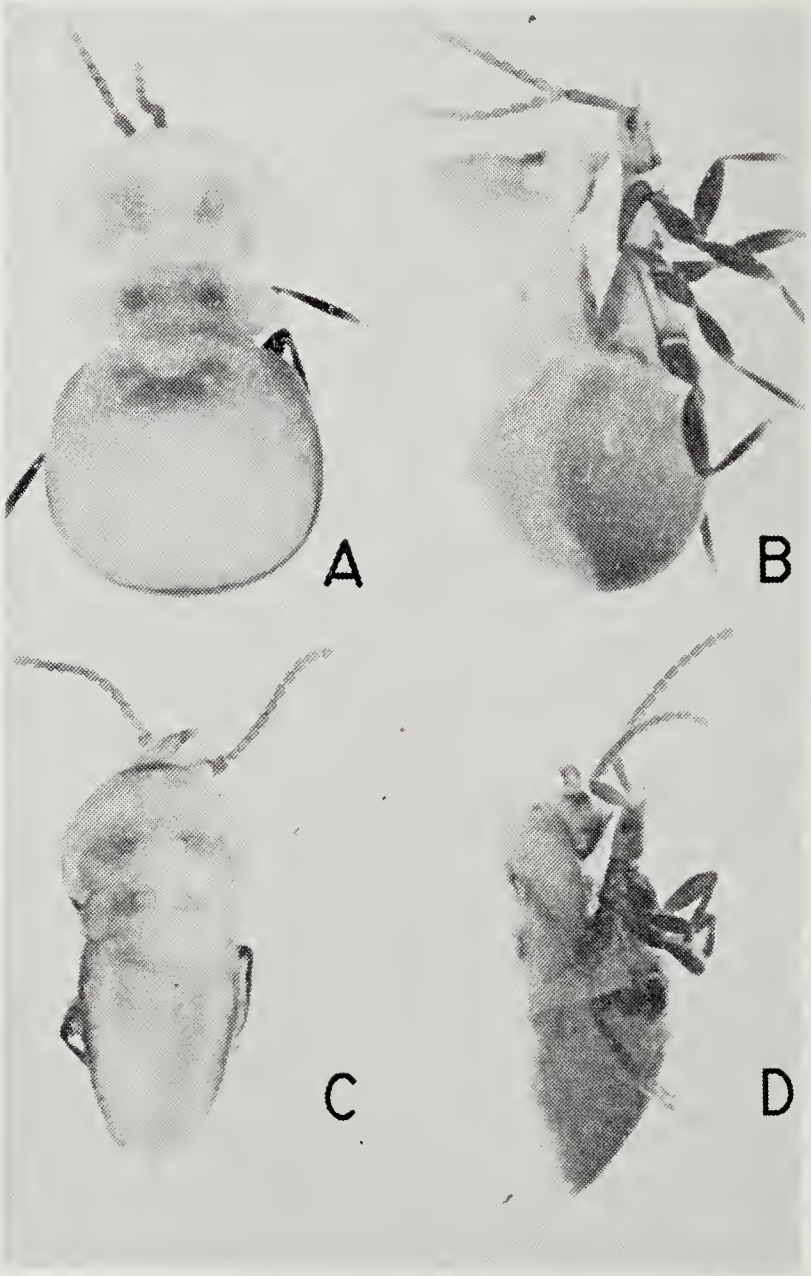

Fig. 3. *Termitomimus entendveniensis* Trägardh: A. Dorsal view; B. Lateral view. *T. hettyae* n.sp.: C. Dorsal view; D. Lateral view. Scale arbitrary, see descriptions for measurements.

Termitomimus hettyae **n.sp.**

Figs. 3C, 3D, and 11

Most closely related to *T. alzadae* n.sp. and *T. vanderlindei* n.sp. from which it is easily distinguished by the unique shape as well as by the wart-like protuberances from the membrane between sternites III and IV. Also related to *T. entend-*

veniensis Trägårdh from which it is distinguished by the same characteristics. This is a highly distinctive species known from 3 colonies from Cape Province.

Overall body shape (dorsal and lateral) as in figs. 3C and 3D. Basic color of the sclerotized portions of the head, pronotum, elytra, and antennae light yellowish brown; dorsal portions of the pronotum not noticeably darker than the rest of the body. Legs dark brown except for the tarsi which are light yellowish brown. Sternites a little darker than the sternites. Basal segment of hind tarsus slightly broader and of approximately equal length to the rest of the tarsal segments collectively.

Membranous parts of abdomen with a sparse covering of inconspicuous fine yellow setae which are neither more numerous nor longer at the curvature. Membrane between sternites III and IV with many wart-like protuberances (fig. 3C). Abdominal sternite III with a median anterior V-shaped notch but with no basic split. Secondary sclerotization is involved in the formation of sternites III, V, VI, and VII. Pseudocaput wider than the pseudothorax. Sternite VIII with 8 setae. Outline of recurved abdomen at the functionally posterior border pointed.

Measurements: Head length, 0.25-0.26 mm; pronotum length, 0.25-0.26 mm; maximum length of the pseudocaput, 0.70-0.71 mm; maximum length of the pseudothorax, 0.33-0.34 mm; length of sternite III, 1.04-1.05 mm; maximum width of pseudothorax, 0.82-0.83 mm; maximum width of the pseudocaput, 1.09-1.10 mm. Number measured, 3.

Holotype: 1, No. 12562, Republic of South Africa, Cape Province, at Murraysburg, 12 October 1963, Coll. J. L. Sheasby, No. T-216. In the National Collection of Insects, Pretoria.

Paratypes: Republic of South Africa, Cape Province: 1, 7 mi. ex Loeriesfontein–Brandvlei, 18 October 1963, Coll. J. L. Sheasby, No. T-217, (NCI); 1, 35 mi. ex De Aar–Philipstown, 23 October 1963, Coll. J. L. Sheasby, No. T-218, (DK).

Notes: The host colonies were all determined as *Trinervitermes trinervoides* (Sjoestedt) by Dr. W. G. H. Coaton. Specimens of the hosts are in the National Isoptera Collection under accession numbers TM13120, TM13123, and TM13125. The distribution of this species is shown in fig. 11.

The ladies who are directly or indirectly involved in the collection of insects are all too often neglected. Our wives have to put up with a lot from all of us who spend time in the field. If they stay home, they must view our trips over the veld in search of termites and termitophiles as lengthy escapes from familial responsibilities. The fact that we revel in the work and reminisce about wonderful sunsets in Zululand over sundowners does little to change their opinions. On the other hand if they go with us they face 15 months of living out of a suitcase, making camp in alien surroundings, a dearth of beauty shops which may last months on end, to say nothing of minor inconveniences such as mosquitoes laden with malarial parasites, etc. It is a wonder that the marriages of most entomologists are as stable as they are. To honor all such ladies and 2 in particular, I am naming this species after Hetty Coaton, the wife of Dr. W. G. H. Coaton, and *T. alzadae* was named for my wife, Alzada Carlisle Kistner.

Termitomimus coatoni **n.sp.**

Figs. 4A; 4B, and 9

This is a highly distinctive species because of the elongation of the latero-ventral edges of the pseudocaput into long membranous appendages. This is not the same sort of abdominal appendage found in *Spirachthodes* Seevers or *Coatonachthodes* Kistner because it lacks a sclerotized insertion socket and is simply a part of the pseudocaput which has become elongated. It is most closely related to *T. vanderlindei* n.sp. and *T. alzadae* n.sp. from which it is distinguished by its abdomen being pointed at the curvature as well as the long projections of the pseudocaput.

Overall body shape (dorsal and lateral) as in figs. 4A and 4B. Basic color of the sclerotized portions of the head, pronotum, elytra, and antennae light yellow-

ish brown with the dorsal portions of the pronotum a little darker but still yellowish brown. Legs blackish brown except for the tarsi which are light yellowish brown. Sternites yellowish brown except for sternite III which is orange-brown. Tergites darker brown in color. Basal tarsal segment of the hind leg slightly broader but much shorter than the rest of the tarsal segments collectively.

Membranous parts of the abdomen with a fine covering of inconspicuous setae which are more numerous and longer at the abdominal curvature (morphologically posterior to sternite III). Abdominal sternite III with no basal median split. Secondary sclerotization is involved in the formation of sternites III, V, VI, and VII. Pseudocaput narrower than the pseudothorax. Sternite VIII with 6 setae. Outline of recurved abdomen at the functionally posterior border pointed.

Measurements: Head length, 0.25 mm; pronotum length, 0.24 mm; maximum length of the pseudocaput, 0.60 mm without the appendage, 1.27 mm with it; maximum length of the pseudothorax, 0.20 mm; length of sternite III, 0.97 mm; maximum width of pseudothorax, 0.95 mm; maximum width of pseudocaput, 0.75 mm. Number measured, 1.

Fig. 4. *Termitomimus coatoni* n.sp.: A. Dorsal view; B. Lateral view. *T. sheasbyi* n.sp.: C. Dorsal view; D. Lateral view. Scale arbitrary, see descriptions for measurements.

Holotype: 1, No. 12560, South-West Africa, 10 mi. ex Kalkfeld—Omaruru, 24 September 1965, Coll. J. L. Sheasby, No. T-434.

Notes: The host colony of this species was determined as *Trinervitermes dispar* (Sjoestedt) by Mr. W. A. Sands. The host specimens are in the National Isoptera Collection, Pretoria, under accession No. TM18119. This species is named for Dr. W. G. H. Coaton whose interest in the termitophiles has led to the intensive collecting effort which has more than doubled the known species from the continent of Africa. The distribution of this species is shown in fig. 9.

Termitomimus sheasbyi **n.sp.**

Figs. 4C, 4D, and 11

A highly distinctive species which is most closely related to *T. hettyae* but is distinguished from it by its overall shape, the lack of wart-like projections from the membrane between abdominal sternites III and IV and the lack of secondary sclerotization of abdominal sternite VII, in fact there is little secondary sclerotization involved in any sternites except the third.

Overall body shape (dorsal and lateral) as in figs. 4C and 4D. Basic color of the sclerotized parts of the head, pronotum, elytra, and antennae light yellowish brown, dorsal parts of pronotum no darker than the head except at the very edges. Legs blackish brown except for the tarsi which are light yellowish brown. Sternites very light yellowish brown except for sternite III which is orange brown. Tergites somewhat darker. Basal segment of the hind tarsus slightly broader and as long as the rest of the tarsus.

Membranous parts of the abdomen with an extensive covering of fine yellow setae which become longer and more numerous at the curvature. Abdominal sternite III with no basal median split. Secondary sclerotization is not involved in the formation of any abdominal sternites except III. Pseudocaput wider than the pseudothorax. Sternite VIII with 6 setae. Outline of recurved abdomen at the functional posterior border pointed.

Measurements: Head length, 0.26-0.27 mm; pronotum length, 0.25-0.26 mm; maximum length of the pseudocaput, 0.58-0.60 mm; maximum length of the pseudothorax, 0.24-0.27 mm; length of sternite III, 0.86-0.87 mm; maximum width of the pseudothorax, 0.86-0.87 mm; maximum width of the pseudocaput, 1.14-1.16 mm. Number measured, 4.

Holotype: 1, No. 12559 Republic of South Africa, Cape Province, 35 mi. ex Poffadder—Springbok, 20 June 1963, Coll. J. L. Sheasby, No. T-71. In the National Collection of Insects, Pretoria.

Paratypes: Republic of South Africa, Cape Province: 1, 22 mi. ex Prieska—Van Wyksvlei, 11 October 1961, Coll. J. L. Sheasby, No. TM9139, (NCI); 2, 30 mi. ex Brandvlei—Williston, 18 October 1963, Coll. J. L. Sheasby, No. T-220, (NCI, DK).

Notes: The host colonies were all determined as *Baucaliotermes hainesi* (Fuller) by Dr. W. G. H. Coaton. Specimens of the hosts are in the National Isoptera Collection, Pretoria, under accession numbers TM11597, TM9139, and TM13129. This species is named for Mr. J. L. Sheasby whose termitophile collections from South and South-West Africa are without parallel. The distribution of this species is shown in fig. 11.

Termitomimus pretoriusi **n.sp.**

Figs. 5A, 5B, and 10

One of the handsomest species of *Termitomimus;* also highly distinctive. It is only likely to be confused with *T. seeversi* n.sp. to which it is most closely related. The easiest character to distinguish them is the shape of the lateral edge of the pseudocaput which is triangular and ventrally directed in *T. pretoriusi* and tubular and dorsally directed in *T. seeversi. T. seeversi* is much more extensively sclerotized than *T. pretoriusi* and the pseudoabdomens and pseudothoraxes have different shapes and proportions (compare figs. 5A and 5C).

Overall body shape (dorsal and lateral) as in figs. 5A and 5B. Basic color of the head, pronotum, elytra, and antennae yellowish brown with the dorsal parts of the pronotum somewhat darker. Legs blackish brown except for the tarsi which are light yellowish brown. Sternites all orange-brown, sternite III somewhat brighter orange-brown than the rest. Tergites somewhat darker. Basal tarsal segment of the hind leg slightly broader and very slightly shorter than the rest of the tarsus.

Membranous parts of the abdomen with a sparse covering of fine yellow inconspicuous setae which do not increase in frequency or length at the curvature. Abdominal sternite III with a median ventral anterior V-shaped split. Secondary sclerotization is involved in the formation of sternites III, IV, V, VI, and VII. Pseudocaput somewhat variable in width but always slightly wider than the pseudothorax. Lateral edges of the pseudocaput triangular in shape and directed postero-ventrally. Lateral edges of the pseudothorax modified into upward directed lobe-like processes. Sternite VIII with 6 setae. Outline of recurved abdomen at the functionally posterior border blunt but somewhat pointed.

Measurements: Head length, 0.24-0.26 mm; pronotum length, 0.24-0.25 mm; maximum length of pseudocaput, 0.70-1.15 mm; maximum length of the pseudothorax, 0.20-0.21 mm; length of sternite III, 1.40-1.45 mm; maximum width of the pseudocaput, 1.25-1.46 mm. Number measured, 10.

Holotype: 1, No. 12561, South-West Africa, 60 mi. ex Neudamm College—Steinhausen, 2 Oetober 1965, Coll. W. G. H. Coaton, No. T-436. In the National Colleetion of Insects, Pretoria.

Paratypes: South-West Africa: 1, Neudamm College near Windhoek, 16 September 1962, Coll. W. G. H. Coaton, No. TM10772, (NCI); 1, 20 mi. ex Kalkfeld—Omaruru, 24 September 1965, Coll. G. F. Pretorius, No. T-435, (NCI); 10, 40 mi. ex Outjo—Otjikondo, 7 April 1966, ex nest below moundlet, Coll. J. L. Sheasby, No. T-447, (NCI, DK); 2, 40 mi. ex Otjiwarongo—Otavi (19° 45-59′ S, 17° 00-14′ E), 5 September 1966, ex nest below slight moundlet, Coll. J. L. Sheasby, No. T-483, (NCI, DK); 2, 10 mi. ex Otavi—Tsumeb (19° 30-44′ S, 17° 15-29′ E), 5 September 1966, Coll. J. L. Sheasby, No. T-487, (NCI, DK); 1, Ovamboland, 30 mi. ex Ondangua—Ombalantu (17° 30-44′ S, 15° 30-44′ E), 9 September 1966, Coll. J. L. Sheasby, No. T-491, (NCI); 1, Ovamboland, 50 mi. ex Ombalantu—Ombombo Ovambo (17° 45-59′ S, 14° 15-29′ E), 10 September 1966, Coll. W. G. H. Coaton, No. T-492, (NCI); 13, Ovamboland, 30 mi. ex Rua Cana Falls—Eunda (17° 15-29′ S, 14° 30-44′ E), 12 September 1966, Coll. J. L. Sheasby, No. T-493, (NCI, DK); 1, Eiseb Omuramba, 70 mi. ex Otjinenu—Point 71 (20° 30-44′ S, 19° 30-44′ E), 10 April 1967, Coll. W. G. H. Coaton, No. T-536, (NCI); 1, same locality, 10 April 1967, Coll. J. L. Sheasby, No. T-537, (NCI); 1, 30 mi. E. of Tsumkwe on tract to Botswana border (19° 30-44′ S, 20° 45-59′ E), 15 April 1967, Coll. W. G. H. Coaton, No. T-554, (NCI); 6, same loeality and date, Coll. J. L. Sheasby, No. T-555, (NCI, DK); 1, same loeality and date, Coll. G. F. Pretorius, No. T-557, (NCI); 2, 10 mi. ex Tsotsana—Botswana border (18° 45-59′ S, 20° 45-59′ E), 21 April 1967, Coll. J. L. Sheasby, No. T-576, (NCI, DK); 1, 50 mi. ex Runtu—Karakuwisa (18° 30-44′ S, 19° 30-44′ E), 2 May 1967, Coll. J. L. Sheasby, No. T-590, (NCI); 1, 20 mi. ex farm Okosongomingo 149—Lapaloma 438 (20° 45-59′ S, 17° 15-29′ E), 10 May 1967, Coll. J. L. Sheasby, No. T-614, (NCI).

Notes: Most of the speeimens are from colonies determined as *Trinervitermes rhodesiensis* (Sjoestedt). Specimens of these host colonies are in the National Isoptera Collection, Pretoria, under accession numbers TM18390, TM10772, TMI8119, TM19900, TM19982, TM20038, TM20066, TM21233, TM21237, TM2I451, TM21458, TM21464, TM21751, TM22285, and TM22606. A few specimens (10—T-447) were taken from a colony determined as *Trinervitermes rapulum* (Sjoestedt.) Speeimens of this colony are in the same eollection under accession number TM18725. Finally 2 specimens (T-483) were taken from a eolony determined as *Trinervitermes dispar* (Sjoestedt), specimens of which are in the same collection under aceession number TM19871. All determinations were made by Mr. W. A. Sands. This species is named for Mr. G. F. Pretorius who collected part of the type series. The distribution of this species is shown in fig. 10.

Termitomimus seeversi n.sp.

Figs. 5C, 5D, and 10

Most closely related to *T. pretoriusi* n.sp. from which it is most easily distinguished by the shape of the lateral edge of the pseudocaput which is produced into a posterior and dorsally directed lobe. It is also more sclerotized (compare figs. 5A and 5C) and the border of the pseudoabdomen is more evenly rounded.

Overall body shape (dorsal and lateral) as in figs. 5C and 5D. Basic color of the sclerotized parts of the head, pronotum, elytra, and antennae yellowish brown with the dorsal parts of the pronotum dark brown. Legs blackish brown except for the tarsi which are light yellowish brown. Sternites all orange brown with the 3rd sternite just a trifle brighter. Tergites somewhat darker. Basal segment of the hind tarsus somewhat stouter and significantly shorter (0.06 mm) than the rest of the tarsal segments collectively.

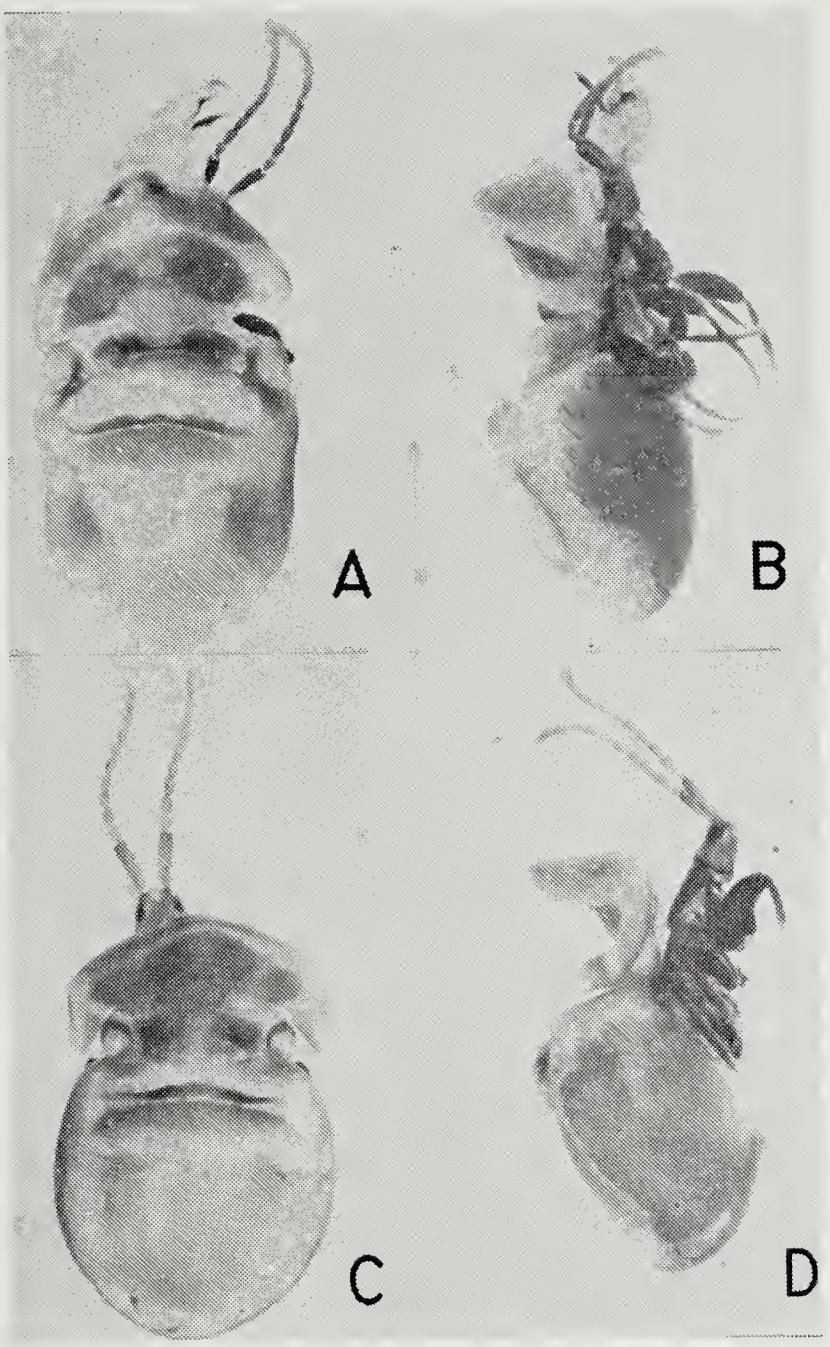

Fig. 5. *Termitomimus pretoriusi* n.sp.: A. Dorsal view; B. Lateral view. *T. seeversi* n.sp.: C. Dorsal view; D. Lateral view. Scale arbitrary, see descriptions for measurements.

Membranous parts of the abdomen with very few inconspicuous short yellow setae which are neither more numerous or longer at the curvature. Abdominal sternite III with a median ventral anterior V-shaped split. Secondary sclerotization is extensive and involved in the formation of sternites III, IV, V, VI, and VII. The shapes of these sclerites may be seen in fig. 5C and compared with those of *T. pretoriusi* n.sp. in fig. 5A. Pseudocaput significantly wider than the pseudothorax. Lateral edges of the pseudocaput produced into a lobe-like structure which is directed posteriorly and dorsally. Lateral edges of the pseudothorax also produced into lobe-like processes which are directed dorsally. Sternite VIII with 8 setae. Outline of the recurved abdomen at the functionally posterior border evenly rounded.

Measurements: Head length, 0.24-0.25 mm; pronotum length, 0.30-0.35 mm; maximum length of pseudocaput, 0.65-0.85 mm; maximum length of pseudothorax, 0.16-0.17 mm; length of sternite III, 1.20-1.27 mm; maximum width of pseudothorax, 0.96-0.98 mm; maximum width of pseudocaput, 1.27-1.41 mm. Number measured, 9.

Holotype: 1, No. 13082, South-West Africa, 45 mi. ex Nakop—Karrasburg, 3 September 1964, Coll. W. G. H. Coaton, No. T-359. In the National Collection of Insects, Pretoria.

Paratypes: South-West Africa: 1, same data as the holotype, (DK); 1, 55 mi. ex Nakop—Karrasburg, 3 September 1964, Coll. G. F. Pretorius, No. T-360, (NCI); 3, 20 mi. ex Onseepkans—Warmbad, 5 September 1964, Coll. W. G. H. Coaton and J. L. Sheasby, Nos. T-361, T-362, and T-363, (NCI, DK); 2, 40 mi. ex Goodhouse—Karrasburg, 6 September 1964, Coll. W. G. H. Coaton and G. F. Pretorius, Nos. T-365 and T-366, (NCI, DK); 1, 40 mi. ex Kalkrand—Maltahöhe, 5 October 1964, Coll. J. L. Sheasby, No. T-371, (NCI).

Notes: The host colonies of all of the specimens were determined as *Baucaliotermes hainesi* (Fuller) by Dr. W. G. H. Coaton. Specimens of the hosts are in the National Isoptera Collection under accession numbers TM14331, TM14341, TM14394, TM14395, TM14396, TM14439, TM14442, and TM15156. This species is named for my late friend and colleague, Professor Charles H. Seevers, Roosevelt University, Chicago. The distribution of this species is shown in fig. 10.

Genus *Nasutimimus* n. gen.

Termitomimus Seevers, 1957: 153 (in part); Pasteels, 1967, 59.

Distinguished from all other genera, at least in its physogastric state, by its distinctive abdomen. Most closely related to *Termitomimus* Trägårdh from which it is easily distinguished by the narrowness of abdominal sternite III which is entirely dorsal in position, by the labial palpi which are 3-segmented, and by the lack of a hyaline triangle at the posterior border of the head.

Overall body shape as in figs. 6 and 7. Head narrower in front than behind, slightly longer than broad, without a median posterior hyaline triangle. Eyes present, both forward and laterally directed. Antennae inserted between the eyes. Gula narrow anteriorly becoming somewhat wider at the base. Mentum-submentum fused, rectangular in shape. Clypeus very short. All mouthparts except for the maxillae are extremely small; the maxillae are only somewhat reduced. Labrum extremely small, reduced to a very thin dorsal flap. Mandibles reduced and shaped as shown for *Termitomimus* (fig. 1A) with no median teeth. Maxillae shaped as in *Termitomimus* (fig. 1B), palpi 4-segmented but with the 4th segment reduced to where it looks like a seta. Labium small, palpi 3-segmented. Antennae 11-segmented, somewhat shorter and more compact than in *Termitomimus*, shaped as in fig. 7B, with 2 coeloconic sensillae on the apical segment.

Pronotum subquadrate, slightly wider than the head, slightly longer than wide, with a median hyaline triangle at the anterior edge, not physogastric. The base of the triangle is at the anterior border and the apex in the midline of the pronotum slightly anterior of the center. Prosternum small, with an evenly rounded ventral median bulge. Mesothoracic peritremes appear straplike because of a pigmented stripe but are actually rather large sclerites which close the procoxal cavities behind and connect laterally to the rest of the thorax. Meso- and metasterna with a sharp line of demarkation between the mesothoracic legs. Mesosternal intercoxal process wide, blunt and acarinate. Meso- and metacoxae widely set apart. Elytra normal, without distinction. Wing stubs show evidence of having been torn off. Legs shaped as in *Termitomimus* but with darker pigmentation and what appears to be more massive sclerotization. Tarsal shape varies by

species. Tarsal formula 4-4-4.

Abdomen description applies to the physogastric phase. Abdomen inflated with large amounts of hypertrophied membrane exposed and the entire abdomen recurved permanently over the dorsal surface of the body (figs. 7A and 7B). All further terminology will apply to the morphological rather than the functional orientation, unless otherwise specified. Abdominal segment I membranous. Tergite II modified into a thin plate with long processes extending posteriorly to help support the massive recurved abdomen. Tergites III-VI closely adherent with the dorsal anterior processes elongated so as to overlap and strengthen the abdomen. Tergite VII, VIII, and IX normal in shape with no very large processes. The paratergites of segments III-VII appear to be fused with the tergites and to be posteriorly developed to overlap the forward directed processes of the tergites. Segment IX trivalved with long asymmetrical anteriorly directed processes in the males and short symmetrical processes in the females. Sternites III-VI relatively normal in shape except for the long strap-like lateral processes which extend laterally about halfway to the tergites. Sternite VII reduced in width but with strap-like processes which extend laterally from the "front" of the pseudocaput. Sternite VIII normal in shape. The precise shape of the abdomen varies by species as well as the precise shape of the sternites but in general there are 3 distinct areas from the morphological posterior to anterior marked by constrictions between abdominal segments V and VI and IV and V which will be called the pseudocaput, pseudothorax, and pseudoabdomen following the tradition of Trägårdh. Male genitalia are relatively large and bulbous and have simple lateral lobes; in general they are not very useful for species discrimination. No sclerotized spermatheca present in females.

Type of the genus: Nasutimimus emersoni (Seevers)

Key to Species of *Nasutimimus*

1. Inflated abdomen with pouches developed laterally from segment IV ..... *N. emersoni* (Seevers)
1′. Inflated abdomen without such pouches ..... *N. latipes* (Seevers)

Nasutimimus emersoni (Seevers) n. comb.

Termitomimus emersoni Seevers 1957: 154, figs. 24a-24c-Field Museum of Natural History, Chicago, (Congo Republic, Kivu Prov., Rwindi Camp, 5 May 1948, Coll. A. E. Emerson, with *Nasutitermes usambarensis* Sjoestedt).

Most closely related to *N. latipes* (Seevers) but distinguished therefrom by the overall appearance, the presence of a pair of lateral pouches from the membrane of abdominal segment IV, its shorter abdomen from the metasternum to the curvature, and by the individual shapes of the abdominal sternites (compare figs. 6A and 6B).

Overall body shape (dorsal and lateral) as in figs. 6A and 7A. Basic color of the sclerotized parts of the head, pronotum, elytra, and antennae yellowish brown, with the dorsal portions of the pronotum no darker than the head. Legs blackish brown except for the medial and apical parts of the coxae and segments 2, 3,

and 4 of the tarsi which are light yellowish brown. All abdominal sternites light yellowish brown. Tergites yellowish brown, support processes of tergite II dark black. Basal tarsal segment of hind leg enlarged in width and more heavily sclerotized than the rest; approximately twice as wide as tarsal segment 2; equal in length to the other 3 tarsal segments collectively.

Membranous parts of the abdomen with an extensive covering of fine yellow inconspicuous setae which become denser and longer at the curvature (morphologically anterior to sternite III). Membrane with many of the setae on wart-like projections. Secondary sclerotization is involved in the formation of sternites V and VI. Pseudocaput approximately the same width as the pseudothorax. Sternite VIII with 0 setae. Outline of recurved abdomen at the functionally posterior border rounded. Segment IV with lateral outpouches.

Measurements: Head length, 0.25-0.26 mm; pronotum length, 0.26-0.27 mm; maximum length of pseudocaput, 0.60-0.62 mm; maximum length of the pseudothorax, 0.12-0.16 mm; maximum length of the outpocketing of segment IV, 0.35-0.36 mm; length of abdomen from metasternum to the curvature, 1.62-1.66 mm; maximum width of the pseudothorax, 0.87-0.89 mm; maximum width of the pseudocaput, 0.86-0.88 mm; maximum width of segment IV, 1.13-1.16 mm. Number measured, 5.

Material examined: The entire type series, (FMNH, BMNH, DK).

Notes: The host was orginally determined as *Nasutitermes usambarensis* (Sjoestedt) by Dr. A. E. Emerson. In the most recent revision of the Ethiopian Nasutitermitinae, this species was listed by Sands (1965, p. 37) as a synonym of *Nasutitermes infuscatus* (Sjoestedt) and the Rwindi Camp specimens are listed among the material examined. The distribution of this species is shown in fig. 12.

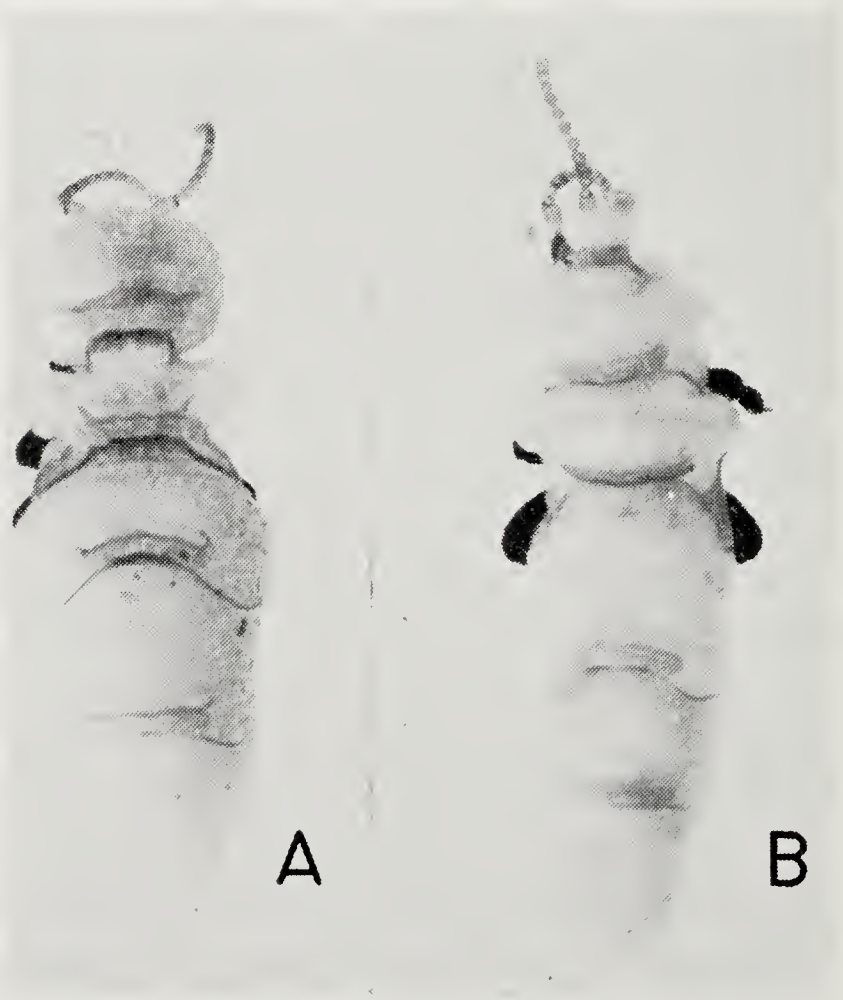

Fig. 6. Dorsal views: A. *Nasutimimus emersoni* (Seevers): B. *N. latipes* (Seevers). Scale arbitrary, see descriptions for measurements.

***Nasutimimus latipes* (Seevers) n. comb.**

Figs. 6B, 7B, and 12

Termitomimus latipes Seevers 1957: 154-Field Museum of Natural History, Chicago, [Congo Republic, Stanleyville, 1 June 1948, Coll. A. E. Emerson, with *Nasutitermes maculiventris* (Sjoestedt)].

Most closely related to *N. emersoni* (Seevers) but distinguished therefrom by its overall appearance, the absence of lateral pouches from the membrane of abdominal segment IV, its longer abdomen from the metasternum to the curvature, and by the individual shapes of the abdominal sternites (compare figs. 6B to 6A).

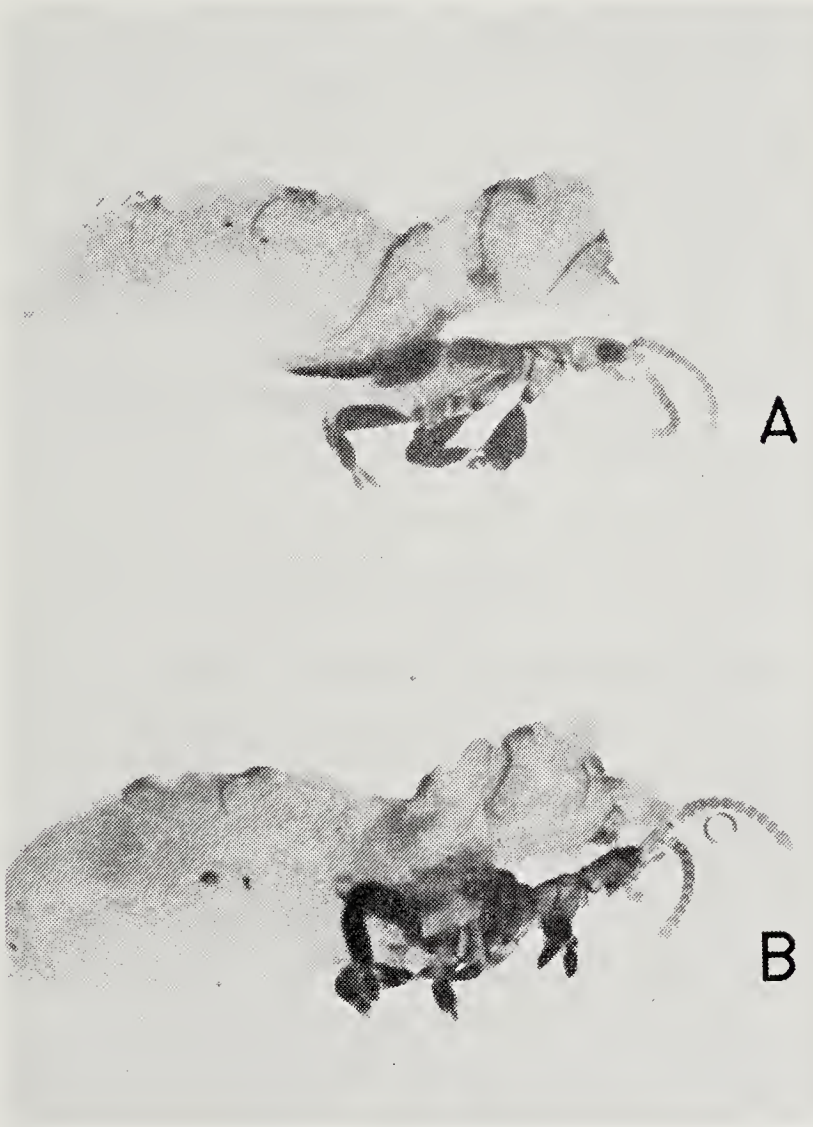

Fig. 7. Lateral views: A. *Nasutimimus emersoni* (Seevers): B. *N. latipes* (Seevers). Scale arbitrary, see descriptions for measurements.

Overall body shape (dorsal and lateral) as in figs. 6B and 7B. Basic color of the sclerotized parts of the head, pronotum, elytra, and antennae yellowish brown, with the dorsal portions of the pronotum no darker than the head. Legs blackish brown except for the medial and apical parts of the coxae and segments 2, 3, and 4 of the tarsi which are light yellowish brown. All abdominal sternites light yellowish brown. Tergites basically also yellowish; support processes of tergite II not particularly black, but somewhat darker. Basal tarsal segment of hind leg enlarged in width and more heavily sclerotized than the rest; approximately 2½-3 times the width of segment 2; slightly longer (0.02 mm) than the other 3 tarsal segments collectively.

Membranous parts of the abdomen with a sparse covering of fine yellow inconspicuous setae which become denser and longer at the curvature. Membrane with some setae on wart-like projections which are limited to the ventral and curvature areas of the abdomen. Secondary sclerotization is involved only in the formation of sternite V. Pseudocaput narrower than the pseudothorax. Sternite VIII with 6 setae. Outline of recurved abdomen at the functionally posterior border rounded. Segment IV with no lateral outpouches.

Measurements: Head length, 0.25-0.26 mm; pronotum length, 0.30-0.31 mm; maximum length of the pseudocaput, 0.17-0.19 mm; maximum length of the pseudothorax, 0.16-0.19 mm; length of the abdomen from the metasternum to the curvature, 1.87-1.94 mm; maximum width of the pseudothorax, 0.91-0.94 mm; maximum width of the pseudocaput, 0.80-0.84 mm. Number measured, 4.

Material examined: The type series, (FMNH, DK).

Notes: The host was originally determined as *Nasutitermes maculiventris* (Sjoestedt) by Dr. A. E. Emerson. In a recent paper Sands (1965, p. 20) made this name a synonym of *Nasutitermes arborum* (Smeathman) and included Stanleyville (now called Kisangani, which used to be the name of one of the native towns near Stanleyville) specimens collected by Emerson in the material examined section. However specimens bearing the date of capture of these termitophiles were not included. Since no specimens bearing this date of capture are listed under any other species of *Nasutitermes* in the same paper, it is highly probable that *N. arborum* is now the correct host name. The distribution of the species is shown in fig. 12.

Relationships of the Species and Host Specificity

Aside from being able to state that *Nasutimimus* is a more primitive genus than *Termitomimus* because of less extensive modification of sclerotized parts and because of more primitive mouthparts, the traditional methods do not permit a formal statement of any other relationships. For this reason numerical methods were used to see what patterns of relationships might emerge. A list of unit characters was developed following the general procedures of Sokal and Sneath (1963). The characters were then coded 0 for absence and 1 for presence. Our programs use the code 3 for no comparisons but for this list of characters there were none of these. The following is the list of characters chosen:

1. Abdominal sternite III located ventrally and extensively sclerotized.
2. Pronotum length 0.30 mm or longer.
3. Pronotum blackish brown.
4. Head with a median posterior hyaline area on the dorsal surface.
5. Width of the basal segment of the hind coxae 2 or more times the width of the 2nd segment.
6. Abdominal tergites IV-VII yellowish brown.
7. Abdominal sternites IV-VIII yellowish brown.
8. Extensive yellow setae on abdominal membranous areas.
9. Basal tarsal segment of hind leg approximately equal to the rest of the tarsal segments in length (less the 0.03 mm difference).

10. Secondary sclerotization involved in sternite IV.
11. Secondary sclerotization involved in sternite V.
12. Secondary sclerotization involved in sternite VI.
13. Secondary sclerotization involved in sternite VII.
14. Abdominal segment IV with lateral outpouchings.
15. Length of the abdominal sternite III or area between the metasternum and the abdominal curvature divided by the maximum width of the pseudocaput is greater than 1.0. This is an indicator of elongation.
16. Dorsal outline of the abdominal curvature pointed.
17. Maximum width of the pseudocaput equal to the maximum width of the pseudothorax (difference is less than 0.02 mm).
18. Basal segment of hind tarsus black.
19. Pseudocaput with posteriorly directed lateral extensions.
20. Setae at the abdominal curvature longer than setae elsewhere on the abdomen.
21. Pseudothorax appendage-like.
22. Basal part of coxae yellowish brown.
23. 6 setae on sternite VIII.
24. 0 setae on sternite VIII.
25. Basal segment of hind tarsus shorter than the rest of the tarsus.
26. Maximum width of the pseudocaput greater than the maximum width of the pseudothorax.
27. Lateral projections of the pseudocaput appendage-like and dorsally directed.
28. Maximum length of the pseudocaput greater than that of the pseudothorax.
29. Physothorax.
30. Maximum length of the pseudocaput more than 4 times the length of the pseudothorax.
31. Abdominal sternite III with a median ventral anterior V-shaped split.

TABLE 1.

Distribution of unit characters in *Termitomimus* and *Nasutimimus* species. Characters are arranged sequentially from left to right.

Species No.	*Species*	
01	*Nasutimimus emersoni* (Seevers)	0000111110110110110101010001010
02	*Termitomimus entendveniensis* Trägårdh	1111001000011000000000101101100
03	*N. latipes* (Seevers)	0100111010100010010101100000000
04	*T. sheasbyi* n.sp.	1001001110000000000100100101100
05	*T. coatoni* n.sp.	1001001000111011001100101001100
06	*T. pretoriusi* n.sp.	1011000001111000000010101101111
07	*T. alzadae* n.sp.	1001001010111000000110101101100
08	*T. hettyae* n.sp.	1001001010111001000000000101100
09	*T. seeversi* n.sp.	1111000001111000000010001111101
10	*T. vanderlindei* n.sp.	1001001000111000000110001101100

The distribution of these characteristics in the 10 species is given in Table 1. These data were then read into an IBM 1620 computer together with a program to produce the simple matching coefficients described by Sokal and Michener (1958). To check the program and the machine, one simply superimposes the data cards for 2 species, counts the holes where the light goes through and divides by the total number of characters less the total characters coded "3" for either or both species. The matrix of these was then loaded back into the computer together with another program to perform the cluster analysis using the weighted pair group method described by Sokal and Sneath (op. cit). For small matrices, the IBM 1620 with 20K cores and disk drive can be used efficiently, but it becomes very time consuming for larger matrices, when you have to keep going to and from the disk all the time. However, for this size matrix the total time involved was 45 minutes, so the machine can handle it quite nicely.

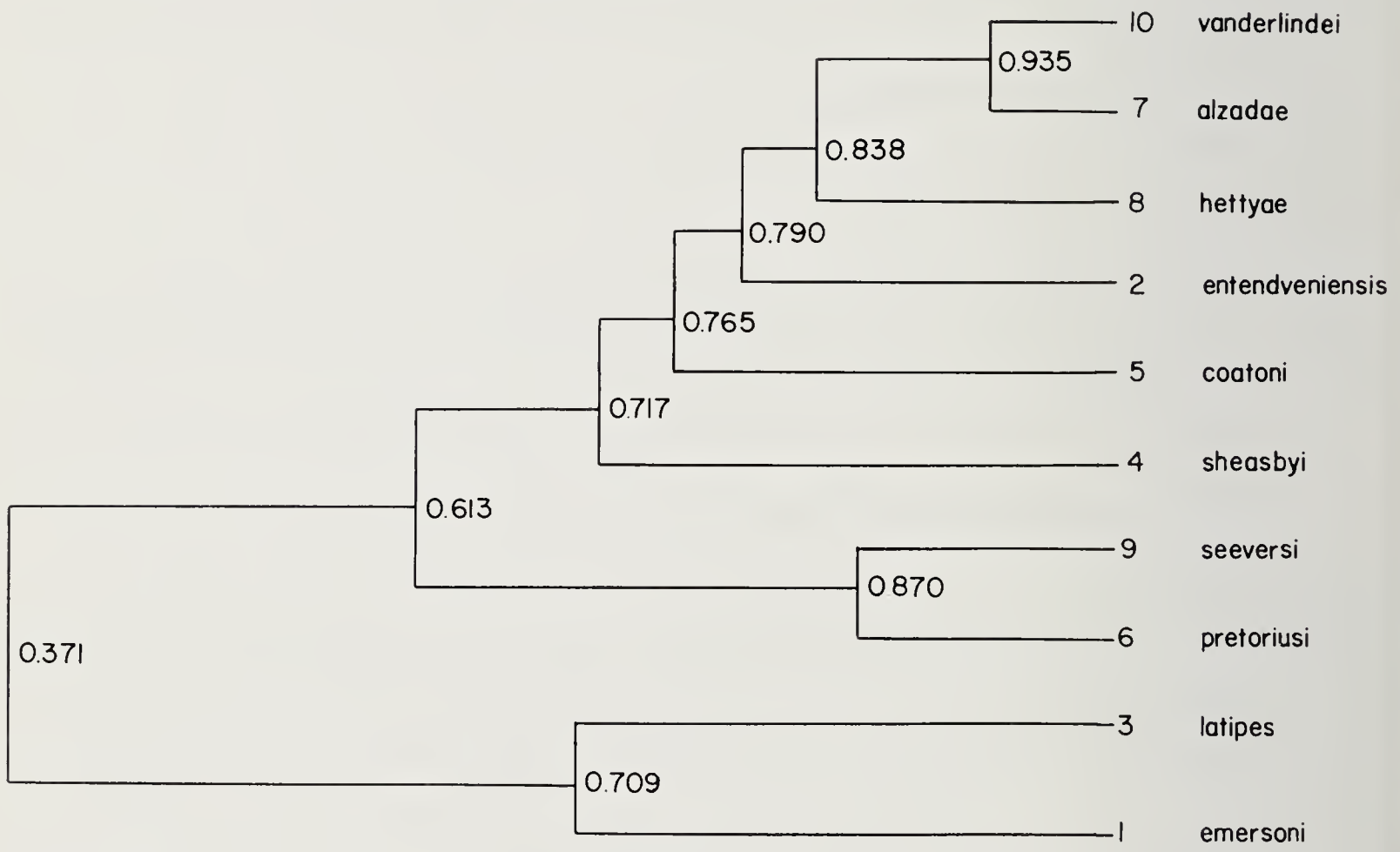

Fig. 8. Diagram of the phenetic relationships between the species of *Termitomimus* and *Nasutimimus*. Values indicate the value at the clustering intersections.

The results of these analyses are presented in fig. 8. The species here separated off into *Nasutimimus* cluster out together and at a relatively low correlation with the species here placed in *Termitomimus*. I really cannot take issue with any of the groupings. There is no doubt in my mind that *T. vanderlindei* and *T. alzadae* are more closely related to each other than to any of the rest of the species. The same is true of *T. seeversi* and *T. pretoriusi*. The species *T. hettyae*, *T. entendveniensis*, *T. coatoni*, and *T. sheasbyi* all cluster out stepwise to the *T. alzadae-T. vanderlindei* cluster. This happens because these species are really more closely related to *T. alzadae* and *T. vanderlindei* than they are to each other. This can be verified by checking the coefficients of association in Table 2. The mechanics of the clustering program make them join as shown in fig. 8. This is not serious so long as you know what it means when looking at the diagram.

TABLE 2.

Matrix of simple matching coefficients of the species of *Termitomimus* and *Nasutimimus*.

Species No.	2	3	4	5	6	7	8	9	10
1	.290	.709	.483	.419	.258	.419	.451	.193	.419
2	1.000	.....	.....	.....	.....	.....	.....	.....	.....
3	.451	1.000	.....	.....	.....	.....	.....	.....	.....
4	.483	.580	1.000	.....	.....	.....	.....	.....	.....
5	.741	.516	.677	1.000	.....	.....	.....	.....	.....
6	.774	.290	.580	.645	1.000	.....	.....	.....	.....
7	.806	.516	.806	.806	.774	1.000	.....	.....	.....
8	.774	.483	.774	.774	.677	.838	1.000	.....	.....
9	.774	.290	.516	.580	.870	.709	.677	1.000	.....
10	.806	.451	.741	.806	.774	.935	.838	.774	1.000

Before pursuing this further, 2 points should be discussed. These are the possible role of postimaginal growth and the host relationships. Seevers (1957) described and presented 3 remarkable photos showing postimaginal growth in *Nasutimimus emersoni* (Seevers). I restudied the same material and came to the same conclusions he did. These changes were fully shown by Seevers and will not be reiterated here. With the above correlation of 4 species to *T. alzadae* and *T. vanderlindei*, together with 2 species being found with each termite sometimes in the same nest, it naturally occurred to me to question whether *T. vanderlindei* was perhaps not the juvenile form of *T. coatoni*; *T. alzadae* the juvenile form of *T. pretoriusi*, *T. hettyae* the juvenile form of *T. entendveniensis*, and *T. sheasbyi* the juvenile form of *T. seeversi*, or if any of these relationships might hold true. I cannot prove that this is not the case but the material does not permit me to say that it is, for unlike Seevers' material, there are no intermediates. And there are no intermediates in spite of the fact that we have nearly 5 times as much material as Seevers had. As the species now stand they are all discontinuous series, and as such they are being interpreted as separate species. This also means that Seevers' comments about postimaginal growth are now restricted to the genus *Nasutimimus*.

The host relationships of the species are presented in Table 3. It will be noted that there are question marks in front of some of the host names. These colonies were so determined by W. A. Sands as stated in the notes appended to the termitophile species in question. However, Sands (1965, p. 77) states, "*Trinervitermes* is the most difficult genus in the Nasutitermitinae, and perhaps in the order Isoptera. In both imagoes and soldiers there is wide variation, and few reliable taxonomic characters. . . . In the case of the soldier caste, only the major soldiers are identifiable to species." Somewhat more specifically, he states (p. 88), "The range of variation in the soldier caste (of *T. dispar*) overlaps with *T. rhodesiensis*, *T. rapulum*, and *T. togoensis*. Some specimens of *T. rhodesiensis* and *T. rapulum* are indistinguishable from some *T. dispar*. . . ." Again he later states (p. 112), "*T. rapulum* is extremely difficult to separate from *T. rhodesiensis* in

many samples of both imago and soldier castes, and these may be regarded as siblings, being partially sympatric." There are only 5 disputed colonies in the lot. In view of the fact that the termitophiles are rather easy to distinguish, I submit that the termitophiles are more sensitive indicators of the termite species in this instance than the termites are themselves.

TABLE 3.

Host relationships of *Termitomimus* and *Nasutimimus*.

Termitophile	Host
T. alzadae	*Trinervitermes rhodesiensis* (Sjoestedt)
	? *T. rapulum* (Sjoestedt)
	? *T. dispar* (Sjoestedt)
T. coatoni	*Trinervitermes dispar* (Sjoestedt)
T. entendveniensis	*Trinervitermes trinervoides* (Sjoestedt)
T. hettyae	*Trinervitermes trinervoides* (Sjoestedt)
T. pretoriusi	*Trinervitermes rhodesiensis* (Sjoestedt)
	? *T. rapulum* (Sjoestedt)
	? *T. dispar* (Sjoestedt)
T. seeversi	*Baucaliotermes hainesi* (Fuller)
T. sheasbyi	*Baucaliotermes hainesi* (Fuller)
T. vanderlindei	*Trinervitermes dispar* (Sjoestedt)
N. emersoni	*Nasutitermes infuscatus* (Sjoestedt)
N. latipes	*Nasutitermes arborum* (Smeathman)

Now if we combine all this into an evolutionary interpretation of this generic group, we have to start with the most primitive stock being the genus *Nasutimimus* for reasons stated earlier. These are associated with *Nasutitermes*. The next most primitive stock would then be the cluster *T. alzadae-T. vanderlindei* from which at an early date the cluster *T. pretoriusi-T. seeversi* split off. This would have to have occurred prior to the separation of the genus *Baucaliotermes* from *Trinervitermes*. Also early, the cluster *T. entendveniensis-T. hettyae* would have to separate from the *T. alzadae-T. vanderlindei* stock, probably prior to the separation of *T. alzadae* and *T. vanderlindei*. Also this could have occurred separately, but it is more probable that they are derivatives from each other because the termite hosts have not evolved to the point where they are given separate names. Finally, *T. sheasbyi* probably evolved from *T. alzadae*, while *T. coatoni* probably evolved from *T. vanderlindei*. This is all consistent with the figures in the similarity coefficient matrix but is a slightly different interpretation than is possible with the clustering techniques used. It is not, however, inconsistent with those results.

If we assume that host specificity is complete and the 5 disputed colonies are *T. rhodesiensis*, then the host relationships would be as follows. At the generic level, *Nasutitermes* would be most primitive, *Trinervitermes* would be derivative from that, and *Baucaliotermes* would be derivative from *Trinervitermes*. These results are consistent with those of Ahmad (1950) and Sands (1965). At the

species level, *Trinervitermes dispar* should be more closely related to *T. rhodesiensis* than to *T. trinervoides*. *Trinervitermes trinervoides* should be more closely related to *T. rhodesiensis* than to *T. dispar* and *Baucaliotermes hainesi* should be more closely related to *T. rhodesiensis* than to the other 2 termite species. It will be interesting to hear what termite specialists think of this.

The rates of evolution then would not be the same. For instance, *Termitomimus hettyae* separated from *T. entendveniensis* even though the termites did not sufficiently evolve to deserve specific separation. This is consistent with a statement by Sands (1965, p. 77), "An interesting result is that the localized operation of distinctive genes or gene complexes has been observed in certain species. . . ." This is the result of partial isolation of populations of species with wide distributions. Since the termites are far more numerous than the termitophiles, what may be partial isolation so far as the termites are concerned could very well act as complete isolation for the termitophiles.

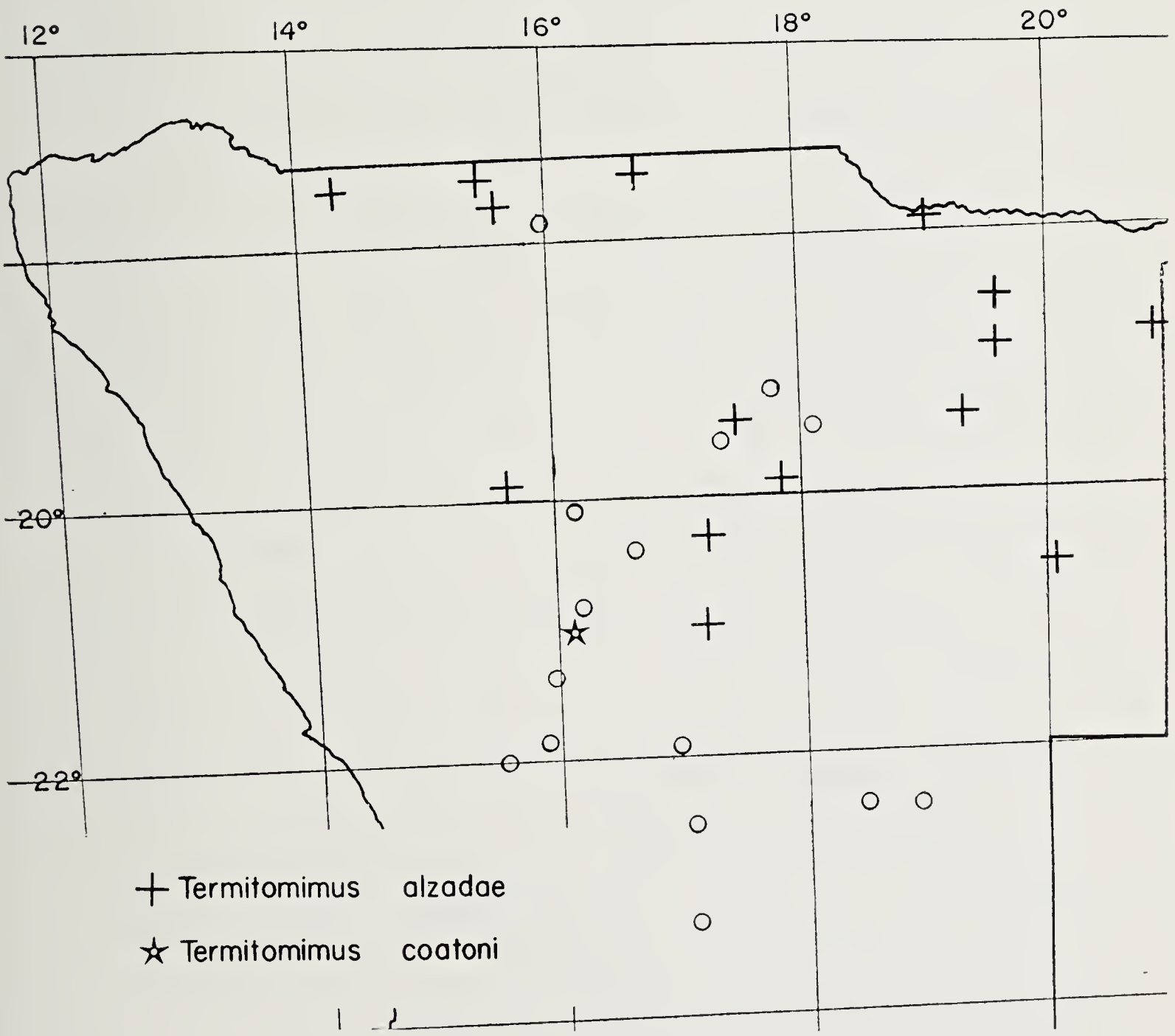

Fig. 9. Distribution of 2 species of *Termitomimus* in South-West Africa. Map was redrawn from the Surveyor General's Map, Windhoek. Open circles represent the location of the larger cities.

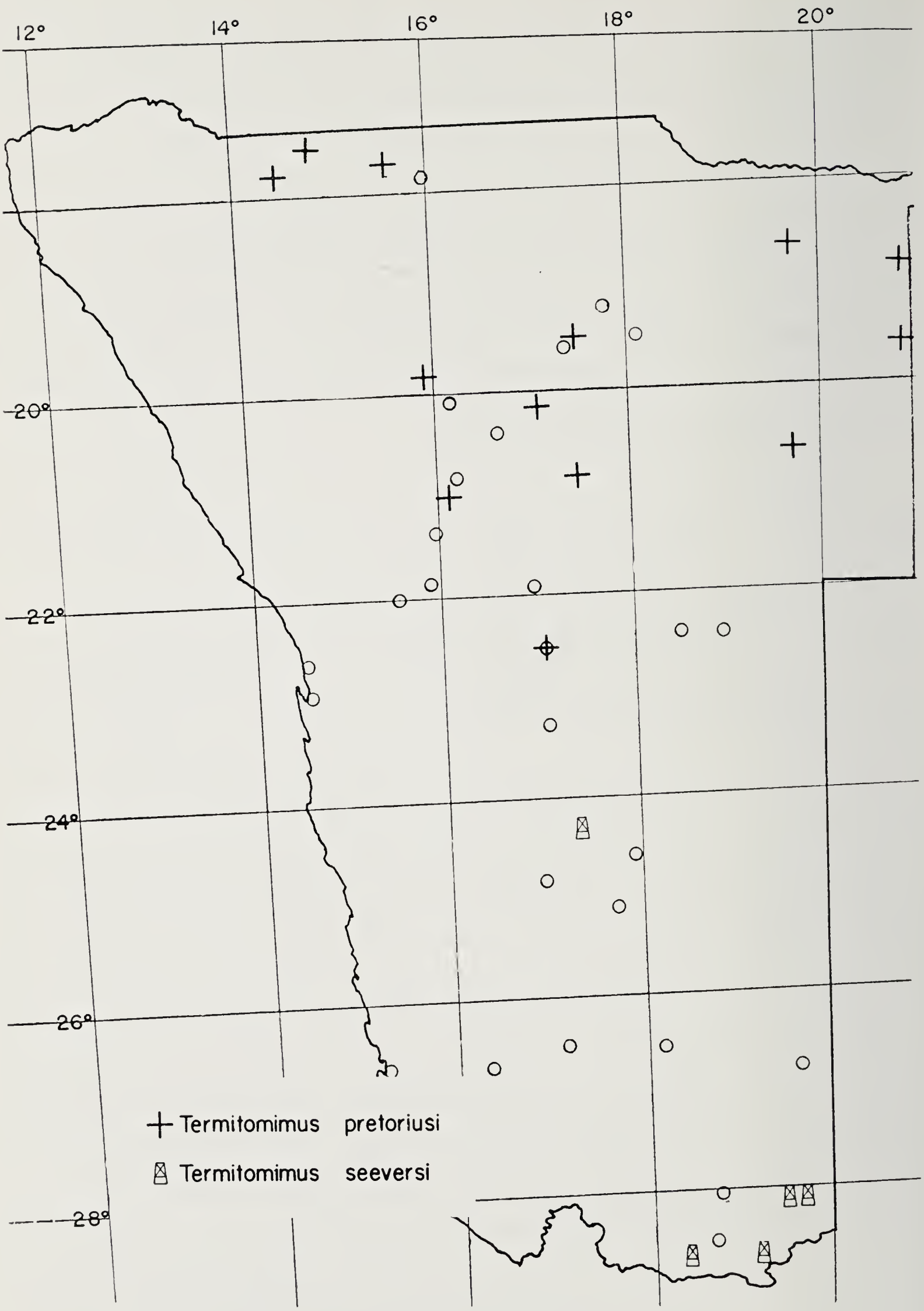

Fig. 10. Distribution of 2 species of *Termitomimus* in South-West Africa. Open circles represent the location of the larger cities.

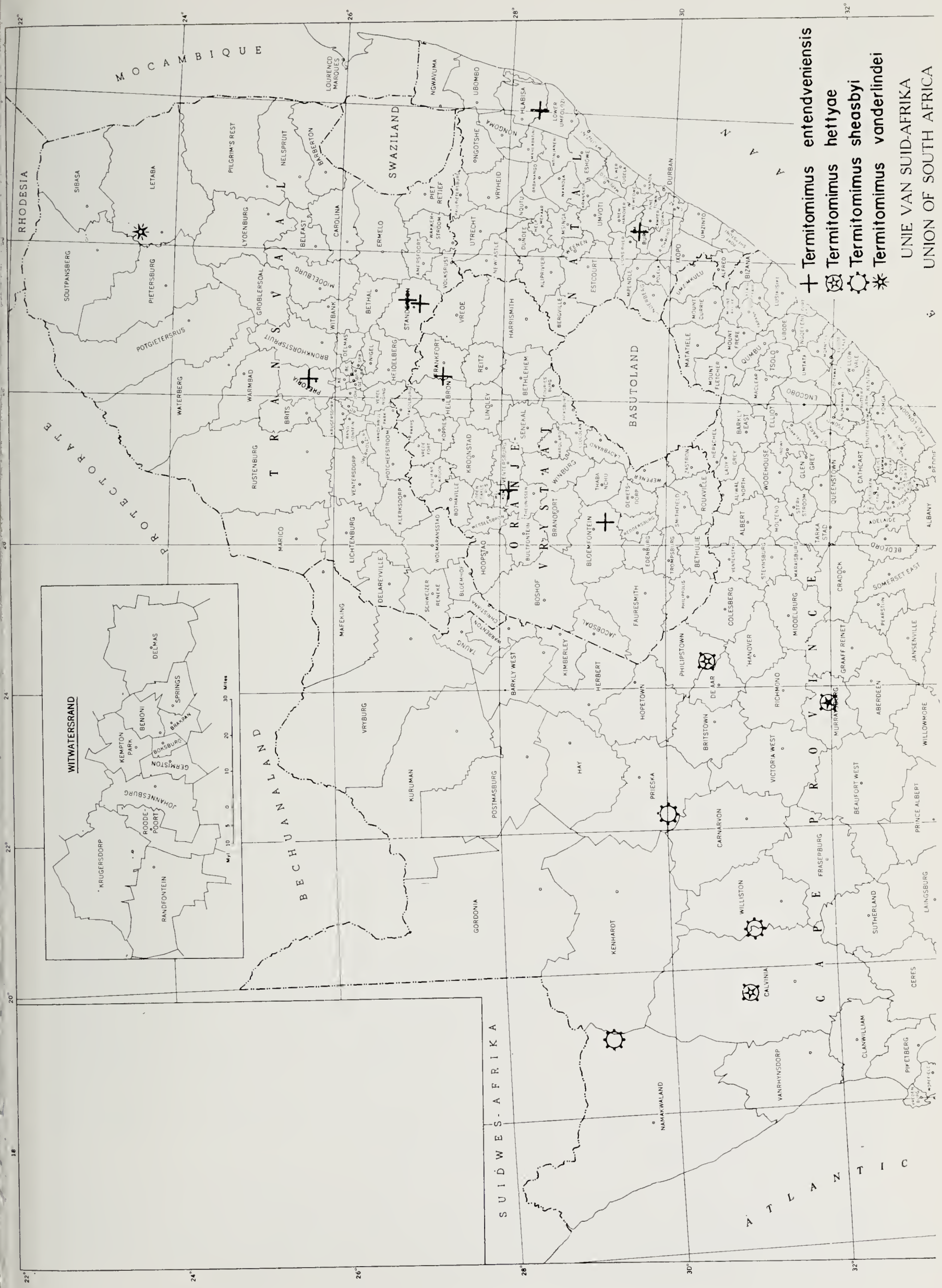

Fig. 11. Distribution of *Termitomimus* sp. in the Republic of South Africa.

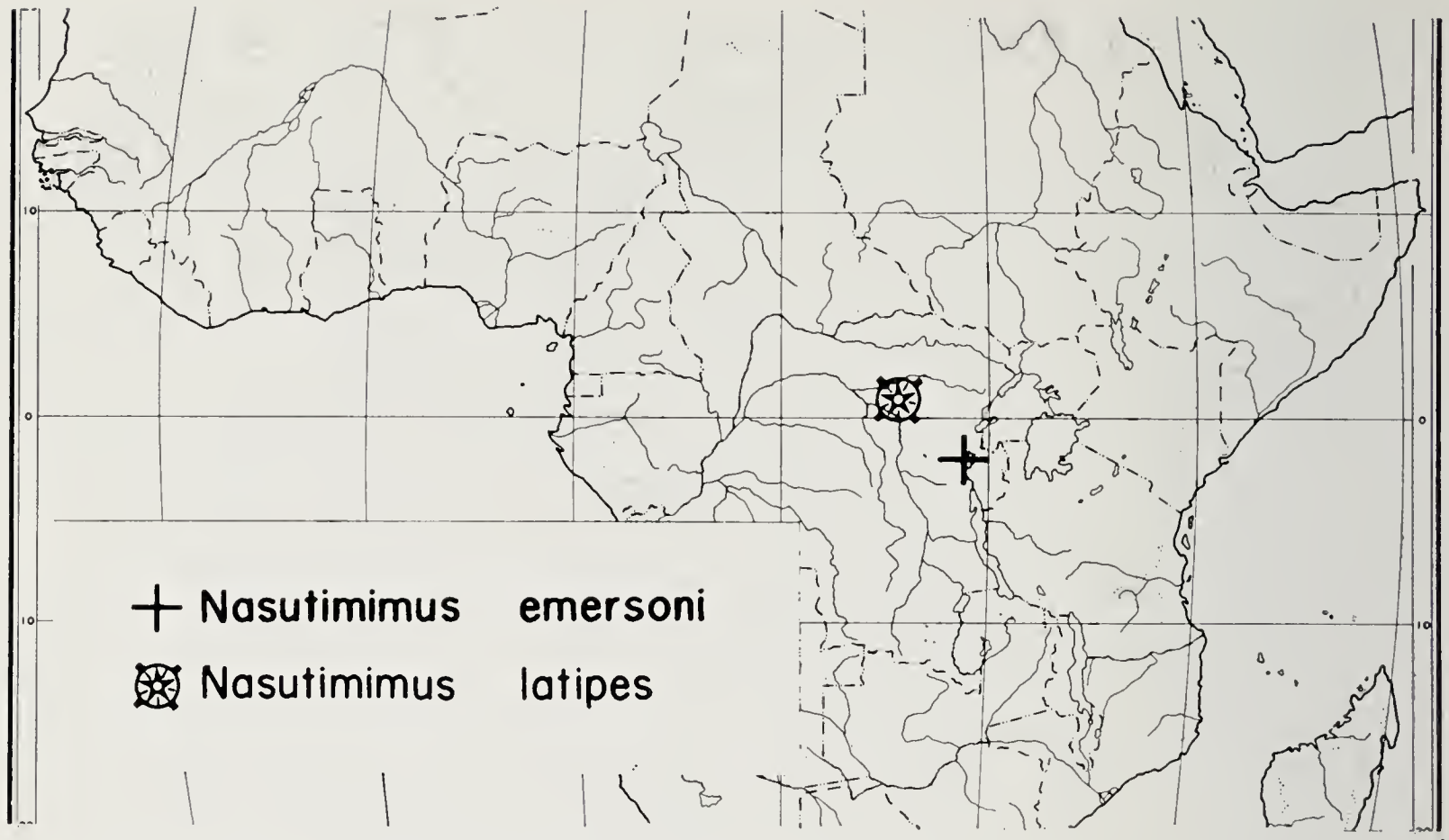

Fig 12. Distribution of *Nasutimimus* sp. in Central Africa.

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Termite host identifications are all individually credited in the text, but I want to again express my thanks to Dr. W. G. H. Coaton and Mr. W. A. Sands, Termite Research Unit at the British Museum (NH) for taking the time to do the determinations. I wish to thank Dr. Alfred E. Emerson for reading the manuscript and making critical comments on it.

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